HITACHI
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SECTION 8
510(k) SUMMARY

JUN 0 7 2013

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of SMDA 1990 and 21 CFR 807.92. The assigned 510(k) number is K120945.

807.92 (a)(1): Name: Hitachi Chemical Diagnostics
Address: 630 Clyde Court
Mountain View, CA 94043

Phone: (650) 961 5501
FAX: (650) 969 2745
Contact: Mr. Charles Tsou

Regulatory Correspondent: Ms. Erika Ammirati

807.92 (a)(2): Device name- trade name and common name, and classification

Trade name:
S TEST Reagent Cartridge Alanine Amino Transferase (ALT)
S TEST Reagent Cartridge Aspartate Amino Transferase (AST)

Common Name: Routine chemistry analyzer for ALT and AST

Classification: ALT- 21 CFR §862.1030, Class I with exemption by 21 CFR §862.9, product code CKA
AST- 21 CRF §862.1100, Class II, product code CIT

807.92 (a)(3): Identification of the legally marketed predicate devices

ALT: K974003- ALT SL Assay (Sekisui Diagnostics, Ltd, PEI, Canada)
AST: K100853- ASTL assay (cobas, Roche Diagnostics, Indianapolis, IN)

807.92 (a)(4): Device Description
The Hitachi Clinical Analyzer is an automatic, bench-top, wet chemistry system intended for use in clinical laboratories or physician office laboratories. The instrument consists of a desktop analyzer unit, an operations screen that prompts the user for operation input and displays data, a printer, and a unit cover. The analyzer unit includes a single probe, an incubation rotor, carousels for sample cups and reagent cartridges, and a multi-wavelength photometer. The single-use reagent cartridges may be placed in any configuration on the carousel, allowing the user to develop any test panel where the reagent cartridges are available.

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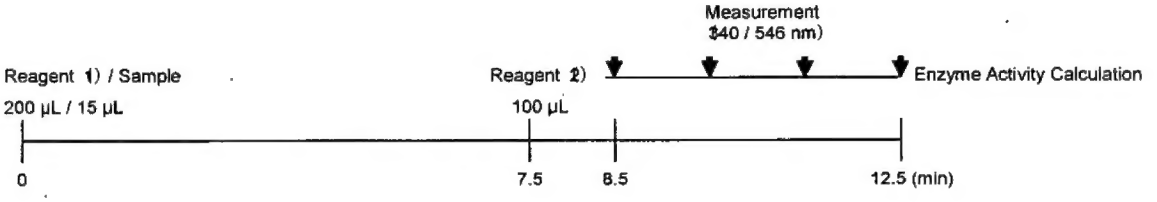
The S TEST reagent cartridges are made of plastic and include two small reservoirs capable of holding two separate reagents (R1 and R2), separated by a reaction cell/photometric cuvette. The cartridges also include a dot code label that contains all chemistry parameters, calibration factors, and other production-related information, e.g., expiration dating. The dimensions of the reagent cartridges are: 13.5 mm (W) × 28 mm (D) × 20.2 mm (H).

System operation: After the sample cup is placed into the carousel, the analyzer pipettes the sample, pipettes the reagent, and mixes (stirs) the sample and reagent together. After the sample and reagent react in the incubator bath, the analyzer measures the absorbance of the sample, and based on the absorbance of the reactions, it calculates the concentration of analyte in the sample. The test system can measure analytes in serum or plasma and results are available in approximately 15 minutes per test. This submission is for reagent cartridge test systems for glucose.

ALT Chemistry Reactions:
Alanine aminotransferase (ALT) catalyzes the reaction from L-alanine and alfa-ketoglutaric acid to pyruvic acid and glutamic acid. When the produced pyruvic acid is converted into lactic acid by lactate dehydrogenase (LD), NADH is converted into NAD with a decrease in absorbance at 340 nm. The ALT activity can be determined by measuring the decreased rate of NADH.

$$\text{L-Alanine + Alfa-Ketoglutaric acid} \xrightarrow{\text{ALT}} \text{Pyruvic acid + Glutamic acid}$$

$$\text{Pyruvic acid + NADH} \xrightarrow{\text{LD}} \text{Lactic acid + NAD}$$



AST Chemistry Reactions:
Aspartate aminotransferase (AST) catalyzes a reaction from L-aspartic acid and α-ketogulutaric acid to oxaloacetic acid and glutamic acid. When the produced oxaloacetic acid is converted into malic acid by malate dehydrogenase (MD), NADH is converted into NAD with a decrease in absorbance at 340 nm. The AST activity can be determined by measuring the decreased rate of NADH.

$$\text{L-Aspartic acid + Alfa-Ketoglutaric acid} \xrightarrow{\text{AST}} \text{Oxaloacetic acid + Glutamic acid}$$

$$\text{Oxaloacetic acid + NADH} \xrightarrow{\text{MD}} \text{Malic acid + NAD}$$

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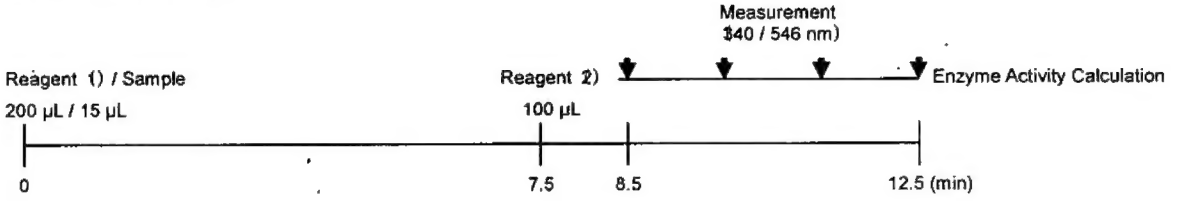
AST (Continued)



807.92 (a)(5): Intended Use
S TEST Reagent Cartridge Alanine Amino Transferase ALT

Indications for Use:
The S TEST Reagent Cartridge Alanine Amino Transferase (ALT) is intended for the quantitative measurement of the activity of the enzyme alanine amino transferase (ALT) in serum, lithium heparin plasma, K3 EDTA plasma, and sodium citrate plasma on the Hitachi Clinical Analyzer E40. The test system is intended for use in clinical laboratories or physician office laboratories. For *in vitro* diagnostic use only. ALT measurements are used in the diagnosis and treatment of certain liver diseases (e.g., viral hepatitis and cirrhosis) and heart diseases.

S TEST Reagent Cartridge Aspartate Amino Transferase AST

Indications for Use:
The S TEST Reagent Cartridge Aspartate Amino Transferase (AST) is intended for the quantitative measurement of the activity of the enzyme aspartate amino transferase (AST) in serum, lithium heparin plasma, K3 EDTA plasma, and sodium citrate plasma on the Hitachi Clinical Analyzer E40. The test system is intended for use in clinical laboratories or physician office laboratories. For *in vitro* diagnostic use only. AST measurements are used in the diagnosis and treatment of certain liver diseases (e.g., viral hepatitis and cirrhosis) and heart diseases.

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807.92 (a)(6): Technological Similarities and Differences to the Predicate

The following chart describes similarities and differences between the two test systems.

Characteristic	Hitachi S TEST Systems	PREDICATE(S)
ALT Test System	K number- K120945	Sekisui ALT-SL- K974003
Device Class, Regulation Code	Class I (reserved), 21 CFR 862.1030	Class I, 21 CFR 862.1030
Classification Product Code	CKA	Same
Intended Use	Quantitative determination of ALT	Same
Testing Environment	Physician office or clinical lab	Clinical lab
Test Principle	NADH oxidation of pyruvate formed by L-alanine and alpha-ketoglutarate in the presence of ALT	Same
Specimen Type	Human serum or plasma	Human serum
Reportable Range	6 to 400 U/L	10 to 600 U/L
Detection Wavelength	340/546 nm	340/415 nm
Detection Limit	2.2 U/L	10 U/L
Linearity	6 to 400 U/L	10 to 600 U/L
Precision	%CVs range from 2.3% to 5.6%	%CVs range from 2.4% to 3.6%

AST Test System	K number- K120945	Roche cobas K number- K100853
Device Class, Regulation Code	Class II, 21 CFR 862.1100	Same
Classification Product Code	CIT	Same
Intended Use	Quantitative determination of AST	Same
Testing Environment	Physician office or clinical lab	Clinical lab
Test Principle	NADH oxidation of pyruvate formed by L-aspartate and alpha-ketoglutarate in the presence of AST	NADH oxidation of pyruvate formed by L-aspartate and 2-oxyglutarate in the presence of AST
Specimen Type	Human serum or plasma	Human serum or plasma
Reportable Range	4 to 400 U/L	5 to 700 U/L
Detection Wavelength	340/546 nm	700/340 nm
Detection Limit	1.4 U/L	5 U/L
Linearity	4 to 400 U/L	5 to 700 U/L
Precision	%CVs range from 1.4% to 3.2%	%CVs range from 0.4% to 3.1%

807.92 (b)(1): Brief Description of Nonclinical Data

A series of studies were performed that evaluated the following nonclinical performance characteristics for ALT and AST: analytical sensitivity (limits of detection), linearity, 20-day in-house precision, interference testing, in-house method comparisons, and matrices comparison between serum and various plasma options.

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Analytical Sensitivity (Limits of Detection)
The studies followed CLSI EP17. The LoD for ALT was calculated to be 2.2 U/L and the LoD for AST was calculated to be 1.4 U/L

Linearity
The studies followed CLSI EP-6A. The ALT S TEST is linear between 6 and 400 U/L and the AST S Test is linear between 4 and 400 U/L.

20-day In-house Precision
The studies followed CLSI EP5-A2, where three levels of samples were each tested four-times a day for 20 days. The results were as follows:

Precision Summary:

		Mean (U/L)	Within-Run %CV	Total %CV
ALT	Level 1	25.3	4.3	5.6
n= 80 per level	Level 2	79.6	1.5	2.7
	Level 3	286.7	1.2	2.3

		Mean (U/L)	Within-Run %CV	Total %CV
AST	Level 1	41.5	2.0	3.2
n= 80 per level	Level 2	109.6	1.1	1.4
	Level 3	304.2	0.9	3.0

Interference Testing
The studies followed CLSI EP7-A2. The data demonstrated that the S TEST for ALT and the S Test for AST were not affected by high levels of the following substances at the levels noted:

ALT
- Hemoglobin: no interference up to 250 mg/dL
- Unconjugated bilirubin no interference up to 25 mg/dL
- Triglyceride: no interference up to 500 mg/dL
- Ascorbic acid: no interference up to 50 mg/dL

AST
- Hemoglobin: no interference up to 31 mg/dL (slight visual hemolysis) for samples at approximately 40 U/L, and up to 125 mg/dL (moderate visual hemolysis) for samples at approximately 100 U/L
- Unconjugated bilirubin no interference up to 50 mg/dL
- Triglyceride: no interference up to 500 mg/dL
- Ascorbic acid: no interference up to 50 mg/dL

Method Comparisons
Method comparison studies evaluated at least serum samples; matched aliquots were assayed with both the Hitachi Clinical Analyzer with S TEST ALT and AST reagent cartridges and routine laboratory methods. The data were analyzed by linear regression (Hitachi = y-axis), and the results were as follows:

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ALT (U/L) Regression Statistics (range = 12 to 392 U/L) :

n	r	Slope (95% CI)	y-intercept (95% CI)
103	0.999	1.09 (1.08 to 1.09)	2.3 (1.4 to 3.3)

AST (U/L) Regression Statistics (range = 5 to 369 U/L):

n	r	Slope (95% CI)	y-intercept (95% CI)
169	0.997	1.09 (1.08 to 1.10)	-3.7 (-4.8 to -2.7)

Matrices Comparisons

A study was performed to validate the use of sodium citrate, lithium heparinized, and K3 EDTA plasma as alternatives to serum for the Hitachi Clinical Analyzer with S TEST ALT and AST reagent cartridges Approximately 35 matched serum/plasma samples that spanned the ALT and AST dynamic ranges were assayed in singleton and the results were compared using least squares liner regression (plasma = y-axis). The performance characteristics were as follows.

ALT Range (serum) = 6-392 U/L

	Na Citrate Plasma n = 28	Heparinized Plasma n = 31	EDTA Plasma = 30
Slope (95% CIs)	0.99x (0.97 to 1.01)	1.02 (1.00 to 1.04)	1.01 (0.98 to 1.04)
y-intercept (95% CIs)	0.2 (-1.9 to 2.3)	0.2 (-1.9 to 2.3)	0.4 (-2.3 to 3.1)
r	0.998	0.998	0.997

AST Range (serum) = 5 to 369 U/L

	Na Citrate Plasma n = 38	Heparinized Plasma n = 38	EDTA Plasma n = 39
Slope (95% CIs)	1.02 (1.00 to 1.04)	1.04 (1.02 to 1.06)	0.98 (0.94 to 1.02)
y-intercept (95% CIs)	-2.6 (-4.4 to -0.9)	0.6 (-1.1 to 2.2)	3.0 (-1.0 to 7.0)
r	0.999	0.999	0.992

807.92 (b)(2): Brief Description of Clinical Data

Studies for precision and method comparison (accuracy) were performed at three external POL-type sites to evaluate the Hitachi Clinical Analyzer with S TEST ALT and AST reagent cartridges in one of its targeted intended use environments, the physician's office laboratory.

For the external site precision study, each site received three blinded serum samples that were chosen to represent low, intermediate, and high concentrations of each analyte. Each sample was assayed six times per day for five days, reporting 30 results per level per analyte. Precision estimates for within-run precision and total precision were as follows (NOTE: precision samples at Site 3 were different than the precision samples at Sites 1 and 2, as materials had been consumed):

Precision Samples at Sites 1 and 2: A, B, and C
Precision samples at Site 3: D, E, and F

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ALT (U/L)
n = 30 replicates per sample per site

Site	Sample	Mean	Within-run Precision		Total Precision	
			SD (U/L)	%CV	SD (mg/dL)	%CV
Site 1	A	51.8	2.0	3.9%	2.0	3.9%
Site 2	A	51.7	2.4	4.7%	2.4	4.7%
Site 3	D	24.3	0.9	3.8%	1.4	5.7%
Site 1	B	143.8	2.2	1.5%	3.4	2.4%
Site 2	B	139.5	2.5	1.8%	2.8	2.0%
Site 3	E	77.4	1.1	1.4%	2.0	2.6%
Site 1	C	319.7	3.8	1.2%	5.0	1.6%
Site 2	C	305.9	4.1	1.3%	7.7	2.5%
Site 3	F	194.4	2.2	1.1%	4.3	2.2%

AST (U/L)
n = 30 replicates per sample per site

Site	Sample	Mean	Within-run Precision		Total Precision	
			SD (U/L)	%CV	SD (mg/dL)	%CV
Site 1	A	76.3	1.9	2.5%	2.0	2.7%
Site 2	A	75.4	1.7	2.2%	1.6	2.1%
Site 3	D	41.0	0.9	2.2%	0.9	2.1%
Site 1	B	156.8	2.1	1.3%	3.8	2.4%
Site 2	B	154.4	2.5	1.6%	4.1	2.7%
Site 3	E	106.1	0.9	0.8%	2.0	1.9%
Site 1	C	356.0	5.8	1.6%	6.9	1.9%
Site 2	C	348.9	7.3	2.1%	20.6	5.9%
Site 3	F	256.9	2.6	1.0%	4.9	1.9%

For the external site method comparisons studies, each POL site received 50 (ALT) to 60 (AST) blinded serum samples that were chosen to represent as full a range of analyte concentrations as possible, and a central laboratory received a matched aliquot for each serum sample. Each sample was assayed by the Hitachi system at the POL sites, and by traditional methods at the central laboratory. The results were analyzed by least squares linear regression (Hitachi = y-axis), and the performance characteristics were as follows:

POL ACCURACY DATA SUMMARY- ALT (U/L)

Site #	n	Range	Regression Equation	"r"	CI* Slope	CI Intercept
1	49	8 to 238	y = 1.09x -0.8	0.998	1.07 to 1.11	-2.3 to 0.8
2	50	9 to 227	y = 1.05 x +0.1	0.997	1.03 to 1.07	-1.7 to 1.9
3	50	8 to 244	y = 1.11x +0.2	0.997	1.08 to 1.14	-2.0 to 2.3

*95% Confidence Interval

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POL ACCURACY DATA SUMMARY- AST (U/L)

Site #	n	Range	Regression Equation	"r"	CI* Slope	CI Intercept
1	64	5 to 359	y = 1.00x -0.1	0.999	0.99 to 1.01	-1.5 to 1.4
2	62	6 to 383	Y = 1.04x -0.3	0.998	1.02 to 1.05	-2.1 to 1.5
3	64	5 to 375	y = 1.05x +0.7	0.999	1.04 to 1.06	-1.1 to 2.5

*95% Confidence Interval

807.92 (b)(3): Conclusions from Nonclinical and Clinical Testing

Nonclinical and clinical testing was performed for the Hitachi Clinical Analyzer with the S TEST ALT and AST reagent cartridges. The test systems were shown to be safe and effective for their intended uses.

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

June 7, 2013

Hitachi Chemical Diagnostics, Inc.
C/O Charles Tsou
630 Clyde Court
MOUNTAIN VIEW CA 94043

Re: K120945
Trade/Device Name: S TEST Reagent Cartridge Aspartate Amino Transferase (AST)
S TEST Reagent Cartridge Alanine Amino Transferase (ALT)
Regulation Number: 21 CFR 862.1100
Regulation Name: Aspartate amino transferase (AST/SGOT) test system
Regulatory Class: II
Product Code: CIT, CKA
Dated: June 04, 2013
Received: June 05, 2013

Dear Mr. Tsou:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please go to http://www.fda.gov/AboutFDA/CentersOffices/CDRH/CDRHOffices/ucm115809.htm for the Center for Devices and Radiological Health's (CDRH's) Office of Compliance. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Carol C. Benson -S for

Courtney H. Lias, Ph.D.
Director
Division of Chemistry and Toxicology Devices
Office of In Vitro Diagnostics
and Radiological Health
Center for Devices and Radiological Health

Enclosure

Indications for Use

510(k) Number (if Known): k120945

Device Name:
S TEST Reagent Cartridge Alanine Amino Transferase (ALT)
S TEST Reagent Cartridge Aspartate Amino Transferase (AST)

Indications for Use:
The S TEST Reagent Cartridge Alanine Amino Transferase (ALT) is intended for the quantitative measurement of the activity of the enzyme alanine amino transferase (ALT) in serum, lithium heparin plasma, K3 EDTA plasma, and sodium citrate plasma on the Hitachi Clinical Analyzer E40. The test system is intended for use in clinical laboratories or physician office laboratories. For *in vitro* diagnostic use only. ALT measurements are used in the diagnosis and treatment of certain liver diseases (e.g., viral hepatitis and cirrhosis) and heart diseases.

The S TEST Reagent Cartridge Aspartate Amino Transferase (AST) is intended for the quantitative measurement of the activity of the enzyme aspartate amino transferase (AST) in serum, lithium heparin plasma, K3 EDTA plasma, and sodium citrate plasma on the Hitachi Clinical Analyzer E40. The test system is intended for use in clinical laboratories or physician office laboratories. For *in vitro* diagnostic use only. AST measurements are used in the diagnosis and treatment of certain liver diseases (e.g., viral hepatitis and cirrhosis) and heart diseases.

Prescription Use X	AND/OR	Over-The-Counter Use
(Part 21 CFR 801 Subpart D)		(21 CFR 807 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of In Vitro Diagnostics and Radiological Health (OIR)

Yung W. Chan -S

Division Sign-Off
Office of In Vitro Diagnostics and Radiological Health

510(k) k120945